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Attorney Docket No.: P051

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In the Board of Patent Appeals and Interferences

Applicant:	Kenneth Noddings et al.
App. No.:	09/954,717
Filing Date:	September 17, 2001
Title:	Fabrication of Optical Devices and Assemblies
Examiner:	Sing P. Chan
Art Unit:	1734

APPEAL BRIEF

In accordance with 37 C.F.R. 41.37, Appellant hereby submits this brief in furtherance of the Notice of Appeal, filed in this case on July 13, 2006, and received by the U.S. Patent and Trademark Office on July 13, 2006.

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On: 12/13/06

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Attorney Docket No.: P051

Table of Contents

I. Real Party in Interest

The real parties in interest in this appeal are the applicants, Daniel Marshall Andrews, Kenneth Noddings, Michael Anthony Olla, and Thomas Alan Bishop, and Michael O. Scheinberg, the attorney of record in the application.

II. Related Appeals and Interferences

There are no prior or other pending appeals, judicial proceedings, or interferences known to appellant which may be related to, directly affect, or be directly affected by, or have a bearing on the Board's decision in this appeal.

III. Status of Claims

A. Total Number of Claims in Application

There are a total of 44 claims in the application.

B. Status of All the Claims

1. Claims cancelled: 3, 14-18, 24-37, and 39-44.
2. Claims withdrawn from consideration but not canceled: None.
3. Claims pending: Claims 1, 2, 4-13, 19-23, 38 and 45-70.
4. Claims allowed: None.
5. Claims rejected: Claims 1, 2, 4-13, 19-23, 38 and 45-70.

C. Claims on Appeal

The claims on appeal are: Claims 1, 2, 4-13, 19-23, 38 and 45-70.

Attorney Docket No.: P051

IV. Status of Amendments

Appellant has not filed any amendments subsequent to final rejection.

V. Summary of Claimed Subject Matter

Claims 1, 19, 20, 38, 45, 51, 56, and 66 are in independent form.

As shown in FIG. 1, claim 1 recites placing first and second components in a mold (step 102) and applying a formable material (step 106) into a mold to form a waveguide for carrying light between the components, with one of the first or second components including a laser or other optical component. Specification, page 10, lines 15-16; page 12, line 4; page 11, lines 12-16. FIGS. 2 and 3 show two different views of a molded waveguide assembly 200. FIG. 4 shows enlarged a portion of waveguide assembly 200 of FIGS. 2 and 3.

Claim 19 is directed to forming the optical waveguide aligned with the optical component by shaping a formable material using the tool. Specification, page 11, lines 3-6; page 10, lines 18-20. As shown in FIG. 1, claim 19 also recites applying a formable cladding material (step 120) over the optical waveguide, after the formable material is hardened (step 110). Specification, page 15, lines 5-7. FIGS. 2 and 3 show a cladding 208 surrounding a portion of molded waveguide core 206. In FIG. 4, the waveguide core 206 is shown as a broken line to indicate that it is under cladding 208, although both materials are transparent.

Claim 20 recites forming a waveguide aligned with the optical component by shaping the formable material using the tool. Specification, page 11, lines 3-6; page 10, lines 18-20.

Claim 38 includes inserting a light-carrying material contacting the optical fiber and forming a light path to or from the optical fiber. Specification, page 23, lines 14-18.

Claim 45 recites forming a light-carrying waveguide with a precision mold having therein a cavity corresponding to the desired shape of the waveguide. Claim 51 recites a waveguide formed in accordance with the method of claim 45. Specification, page 12, lines 4-6; page 16, lines 14-16; page 17, lines 10-12. FIG. 6 shows an exploded view of preferred mold 600 used to

manufacture molded waveguide assembly 202. Cavity plate 614 includes cavities 616 into which the material being molded is inserted, the material taking the shape of the cavities and hardening in that shape.

Claim 56 recites a method of forming an assembly of optical components. Claim 66 recites making an optical assembly. Specification, page 11, lines 9-12.

VI. Grounds of Rejection to be Reviewed on Appeal

A. First Issue

Whether claim 19 is unpatentable under 35 U.S.C. § 102(b) over U.S. Pat. No. 5,031,984 to Eide et al ("Eide").

B. Second Issue

Whether claims 20-23, 38, 45-51, 56-61 and 66 are unpatentable under 35 U.S.C. § 102(b) over U.S. Pat. No. 4,662,962 to Malavieille ("Malavieille").

C. Third Issue

Whether claims 1, 2, and 55 are unpatentable under 35 U.S.C. § 103(a) over Eide in view of Malavieille. (Appellant assumes that the first "55" should be "54," which is also dependent on claim 1.)

D. Fourth Issue

Whether claims 4-13 are unpatentable under 35 U.S.C. § 103(a) over Eide in view of Malavieille and further in view of U.S. Pat. No. 4,466,697 to Daniel ("Daniel").

E. Fifth Issue

Whether claims 52-54 are unpatentable under 35 U.S.C. § 103(a) over Eide in view of Malavieille and further in view of U.S. Pat. No. 5,389,312 to Lebby et al ("Lebby").

F. Sixth Issue

Whether claims 62-70 are unpatentable under 35 U.S.C. § 103(a) over Malavieille and further in view of U.S. Pat. No. 6,208,791 to Bischel et al ("Bischel").

VII. Argument

Overview

Embodiments of the invention include molding a wave guide in alignment with an accurately positioned optical component. Embodiments of the invention can eliminate the need for active alignment of optical components by precisely positioning the active component in a mold, and then forming a waveguide in the mold, the waveguide being formed in aligned with the optical component. These processes are not taught or suggested by the cited references.

Molding waveguides in proximity to optical components can provide other advantages as described in the specification and claims. For example, a waveguide having an angled surface can be molded above a vertical cavity surface emitting laser (VCSEL) to not only eliminate the need for active alignment, but to redirect the light from a vertical direction into a subsequent component. Also, terminals can be molded onto the end of optical fibers, to reduce or eliminate the requirement for precisely cutting and polishing the fiber ends as described in the references.

Eide teaches an electro-optical module containing at least three ports and "containing at least one active electro-optical converting device and at least one passive coupler." Col. 2, lines 24-26. "Small size and good coupling are achieved through the use of a passive coupler device constructed by mounting the ends of specially prepared optical fibers on a glass substrate on which the fibers are selectively oriented to provide the desired optical coupling or splitting." Col. 2, lines 50-56. That is, Eide does not teach molding a waveguide; it teaches aligning optical fibers.

Eide teaches actively aligning the optical fibers with the active components. "The optical fibers are then physically adjusted while monitoring the light detectors to determine when maximum light coupling is achieved. The physical adjustment of the fibers is done in two ways: rotation of the fibers for end surface alignment, and axial movement to minimize fiber spacing at the junction. When the desired alignment is attained, the adhesive is subjected to ultraviolet light through the glass substrate and is thereby cured." Col. 4, lines 23-31.

In another embodiment, Eide state: "The alignment of fibers 14 and 12 is achieved by observing the ends of the two fibers in a microscope and aligning the fibers such that the two surfaces are parallel. Fiber 16 is actively aligned by monitoring and maximizing the optical power detected on fiber 16 when infecting on fiber 12." Col. 5, lines 35-40. In yet another embodiment, Eide states: "The fibers are first set in place with the ends through the holes 69 and are then fixed with epoxy. The active devices are placed in the inserts 70 and are aligned to the fibers by optically monitoring to determine the optimum position. After reaching optimum position and active devices are fixed using epoxy between the metal insert 70 and active devices 30 and 28." Col. 6, lines 51-56.

Similarly, Malavieille teaches a method of connecting optical fibers. The fibers are inserted into a groove in a support from opposite ends and the opposing fiber ends are positioned close to each other, preferably between one tenth and one half of the fiber diameter, so that the light exiting one enters the other. Col. 7, lines 5-10. The gap prevents damage when the splice expands or contracts as temperature changes. Col. 7, lines 10-16. The fibers are aligned "under microscopic examination." Col. 8, line 30. Thus, Malavieille does not teach forming a waveguide aligned to a component, but teaches aligning optical fibers to conduct light between them.

The invention entails molding a waveguide to optically connect components. Rather than the prior art method of actively aligning an optical fiber with a component by observing the output of the fiber, a component in some claims is accurately positioned in a precision mold and a waveguide is formed in the mold to connect the component with the fiber. Both Eide and Malavieille teach aligning fibers to each other with an index matching adhesive; neither teaches forming a waveguide aligned with an active optical component. Eide teaches aligning optical fibers, and then specifically requires active alignment to a component (col. 5, lines 35-40). Malavieille teaches only splicing optical fibers and does not teach connecting a fiber to an active device.

Claims 61 and 64-70 specifically refer to eliminating the requirement for active alignment.

A. First Grounds of Rejection

Claim 19 stands rejected under 35 U.S.C. § 102(b) over Eide.

Claim 19 includes: "forming the optical waveguide aligned with the optical component by shaping a formable material using the tool." Eide teaches butting optical fibers together. "Thus, when the fibers are joined at junction 18, the cores of all three fibers are in contact with each other." Col. 4, lines 8-19. "The fiber ends should be as close together as possible." Col. 6, lines 13-14. The fibers are held in place by an ultraviolet curable adhesive that includes index-matching characteristics. Thus, Eide does not teach forming a waveguide by shaping a formable material; the optical fibers are juxtaposed to transfer light between them.

The Examiner apparently considers the adhesive to be a "waveguide." While the adhesive is an "index matching" material, there is no indication that it is functioning as a

waveguide, or that it has the properties and dimensions that would make it possible to function as a wave guide. With the fibers butting or very close, the waves are not "guided" between the fibers. Moreover, a waveguide requires not only particular intrinsic properties such as an appropriate index of refraction, but also requires particular dimensions and shape so that the light being carried does not leave the material, for example, because the angle of incidence on the material wall is too great. The adhesive diameter appears to be larger than the diameter of the optical fiber. Eide, FIG. 2, adhesive 20. Thus, it would not guide light from one fiber into the next. There is no teaching that the adhesive is designed to function as a waveguide or that it does so.

Definitions of waveguide were provided in Applicant's May 5, 2005 Response, after the previous Examiner asserted that an opaque potting compound was a waveguide. "Waveguide" is defined, for example, in a Glossary of Fiber Optic Terms at http://www.assemblymag.com/CDA/ArticleInformation/news/news_item/0,6501,98333,00.html as: "A structure that guides electromagnetic waves along its length. An optical fiber is an optical waveguide." Similarly, the Photonics dictionary at http://www.photonics.com/dictionary/ defines "waveguide" as "A system or material designed to confine and direct electromagnetic waves in a direction determined by its physical boundaries." Wikipedia defines waveguide at http://en.wikipedia.org/wiki/Optical_waveguide as: "An optical waveguide is a form of a dielectric waveguide, that is capable of guiding an optical signal. The optical waveguide can be used as an component in integrated optical circuit or as a transmission medium in local or long haul communication systems. Optical waveguides can be classified according to their geometry (planar, strip or fiber waveguides), mode structure (single-mode, multi-mode), refractive index distribution (step or gradient index) and material (glass, polymer, semiconductor)."

Eide's adhesive 20 does not "confine and direct electromagnetic waves in a direction determined by its physical boundaries" when Eide's optical fibers are butted against one another. In his obviousness rejection of claims 1, the Examiner appears to define a waveguide as any medium that forms an optical path between components. That is not the definition of a "waveguide." When someone uses an infrared remote control for a television, the air forms an optical path between the remote and the TV, but the air is not a waveguide because it does not "confine and direct" the IR radiation "in a direction determined by its physical boundaries." Similarly, the adhesive at two butting or closely spaced optical fibers does not confine and direct the light in a direction determined by its physical boundaries and so is not a waveguide.

The Examiner states that Eide says the fibers can be separated, but the recommended gap is one tenth to one half the diameter of the fiber. Col. 7, line 4-10. With this small gap, the adhesive is not functioning as a waveguide. Moreover, there is no indication that the adhesive has the dimensions or other properties to contain and direct a beam of light. FIG. 2, adhesive 20 has a diameter greater than that of the optical fiber, and thus would not guide light back into the fiber.

Claim 19 also recites "after the formable material is hardened, applying à formable cladding material over the optical waveguide." The final rejection does not address the "cladding" limitation, and Eide does not teach applying a formable cladding material over a formable waveguide material and does not therefore anticipate claim 19. In his response to arguments, the Examiner states that Eide discloses "a plastic cover over and a sealant material for covering the mounted body, i.e., a cladding material." The term "cladding" in the optical fiber art does not include any cover. As described in the specification, a "cladding has an index of refraction slightly less than that of the core to assist in guiding the light." It is not clear what the Examiner considers the "cladding," but the cover, housing 56, of Eide is not a "cladding" as understood by those skilled in the art.

B. Second Grounds of Rejection

Claims 20-23, 38, 45-51, 56-61 and 66 stand rejected under 35 U.S.C. § 102(b) over Malavieille.

Claim 20 recites "forming the optical waveguide aligned with the optical component by shaping the formable material using the tool" Like Eide, Malavieille teaches butting the ends of the optical fiber together with a small gap to absorb small compressions or tractions. Col. 7, lines 4-16. Malavieille also teaches an index-matching, settable liquid, "preferably a glue" in the groove in which the fibers are placed. Col. 4, lines 58-62. As described above with respect to Eide, the glue is not required to guide the radiation because the fibers are close to each other, and there is no indication that the configuration of the glue is capable of "directing and containing" the radiation. Like Eide, Malavieille's FIG. 2 shows the adhesive 59 is larger that the optical fiber in most places, and so would not effectively guide light back into the optical fiber even if the spacing between the fibers were great enough to require a wave guide.

Appellants submit that claims 21-23 are patentable for the reasons described above with respect to claim 20.

Moreover, claim 21 includes molding a support structure to the waveguide. The support structure in Malavieille is plate 8, which is made of glass (col. 4, lines 58-59), which is provided ready-made, and is not molded onto the waveguide. The optical fibers are held to the plate 8 by the glue. Col. 4, line 63-68. The Examiner states that the protective resin is a support structure. Appellant submits that the plate 8, which is not molded, is the support structure and the resin is a protective layer. There is no indicator that the resin is sufficiently stiff to form a support structure, and plate 8 makes such stiffness unnecessary.

Claims 22 include "contacting a prefabricated molded support structure onto the optical waveguide." Malavieille's glass plate 8 is not a molded support structure, and neither is Malavieille's protection resin.

Claim 38 includes a "light-carrying material contacting the optical fiber and forming a light path to or from the optical fiber, the light path including . . . a distal end formed into a connecting structure." The adhesive liquid of Malavieille does not form a "connecting structure." It is not clear from the rejection what structure in Malavieille the Examiner considers to be the "a distal end formed into a connecting structure."

Claim 45 recites "inserting a formable material into the cavity of the precision mold, the formable material taking on at least in part the shape of the cavity to form the waveguide." As described above with respect to claim 20, Malavieille does not teach a formable waveguide and therefore does not anticipate claim 45. Claims 46-51, being dependent on claim 45, are also patentable.

With regard to claims 47 and 48, Malavieille does not teach a molding a support structure onto the waveguide, as described above with respect to claim 21. With regard to claim 48, Malavieille does not teach molding a cladding material, that is "a material that "has an index of refraction slightly less than that of the core to assist in guiding the light." The index matching material would not be a cladding material because it has the same index of refraction as the optical fiber. There is no teaching in Malavieille that resin 80 has the properties to function as a cladding material. With regard to claim 50, as described above, Malavieille does not teach a second formable material to clad the waveguide material; as described above, the resin 80 is not a cladding material, as that material is used in the art.

With regard to claim 56, as described above, as described above with respect to claim 20 and 45, Malavieille does not teach "applying a formable material into the mold to form a light-carrying waveguide between the first and second components." Claims 57-60, as dependent on claim 56, are also patentable. Regarding claim 58, as described above with respect to claim 21, Malavieille does not teach a support structure molded onto the components and the waveguide. Regarding claim 59, as described above with respect to claim 48, Malavieille does not teach molding a cladding material.

Claim 61 states: "the light carrying waveguide guide being sufficiently aligned with the active optical element to eliminate the need for active alignment," whereas Malavieille teaches splicing optical fibers, not aligning an active component and teaches alignment using a microscope.

Claim 66 similarly states: "the alignment structure providing sufficiently accurate alignment to eliminate the requirement for active alignment." Malavieille teaches using a microscope to position the fibers. Col. 8, line 29.

C. Third Grounds of Rejection

Claims 1, 2, and 55 stand rejected under 35 U.S.C. § 103(a) over Eide in view of Malavieille.

Claim 1 "applying a formable material into the mold to form a waveguide for carrying light between the first and second component." As described above, neither Eide nor Malavieille teach a formable waveguide for carrying light between two components.

As described above with respect to claims 19 and 20, an index-matching adhesive positioned between two adjacent fibers is not a waveguide. Even if the adhesive were a waveguide, both Eide and Malavieille slice optical fibers and do not teach forming a waveguide to an active component. Eide teaches actively aligning an optical fiber to the active component. Col. 6, lines 51-56. Claims 2 and 55 are patentable as dependent on claim 1.

D. Fourth Grounds of Rejection

Claims 4-13 stand rejected under 35 U.S.C. § 103(a) over Eide in view of Malavieille and further in view of Daniel.

Daniel teaches an optical fiber having scattering centered within the fiber and having a protective coating. Daniel does not make up the deficiencies of Eide and Malavieille as described above with respect to the parent claim 1. In particular, with respect to claims 10 and 11, Daniel teaches a protective layer on an optical fiber and does not teach "applying a second formable material to fix the first and second components together in alignment."

E. Fifth Grounds of Rejection

Claims 52-54 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Eide in view of Malavieille and further in view of Lebby.

Appellants submit that claims 52-54 are patentable for the reasons described above with respect to parent claim 1. Lebby teaches molding a structure 20 of a cladding material having internal passages 40, and then filling passage 40 with a waveguide material. A component (not shown) is then positioned on a cut face 52' of the assembly. Thus, Lebby does not teach. positioning a first and second component in a mold and forming a waveguide between them, as stated in claim 1, and Lebby does not make up for the deficiencies of Eide or Malavieille.

The Examiner states that it would have been obvious to use bumps as disclosed by Lebby in the method of Eide as modified by Malavieille. Lebby teaches cutting the connector at 52' to leave electrical contacts for attaching an active device using, for example, soldering or bump bonding. Lebby teaches using bumps to attach the active component to an already formed waveguide, but neither Lebby nor the combination teaches or suggests positioning an active component in a precision mold and forming a waveguide between the active component and a second component. Lebby does not show how bumps would be accurately aligned, that is, Lebby does not teach mating indentations to correspond to the bumps.

F. Sixth Grounds of Rejection

Claims 62-70 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over Malavieille and further in view of Bischel.

Appellants submit that claims 62-65 are patentable for the reasons described above with respect to parent claim 61 and claim 67-70 are patentable for the reasons described above with respect to claim 66.

The Examiner states that "forming the waveguide by injecting or screening or stenciling a wave-guide material onto the mold plate is well known and conventional as shown for example by Bischel et al."

Bischel teaches stencil printing a re-radiator material, not the waveguide itself, onto a substrate having a waveguide. Bischel deposits a waveguide core 205 over the substrate surface, and then patterns it using, for example, reactive ion etching or laser ablation. Col. 8, lines 1-35. Alternatively, Bischel teaches forming a waveguide using indiffusion. Col 8, lines 56-62.

Thus, Bischel does not teach stencil printing a formable waveguide material. In fact, the purpose of the "re-radiator" material of Bischel is to radiate, not to direct and guide light. Moreover, Bischel is directed to an integrated optical structure on a substrate, such as a pixel display, and does not teach positioning components in a mold and then molding a waveguide that is aligned with the components.

Summary

Appellant submits that pending claims 1, 2, 4-13, 19-23, 38 and 45-70 are neither anticipated nor rendered obvious over the references, and respectfully requests that the rejection be overturned.

Respectfully submitted,

Date: December 13, 2006

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IX. Claims Appendix

1. A method of forming an assembly of optical components, comprising:

providing a mold;

positioning a first component in the mold;

positioning a second component in the mold; and

applying a formable material into the mold to form a waveguide for carrying light between the first and second components, the waveguide forming an optical path between the first component and the second component, at least one of the first or second components including a laser or other active optical component.

2. The method of claim 1 in which one of the first or second components is an optical fiber or other passive optical component.

3. (cancelled)

4. The method of claim 1 further comprising removing the first component, the second component, and the waveguide from a mold used to form the waveguide by providing a support structure to support the first component, the second component, and the waveguide as it is removed.

5. The method of claim 4 in which the support structure is adhered to the first component, the second component, and the waveguide.

6. The method of claim 5 in which the support structure is molded onto the first component, the second component, and the waveguide.

7. The method of claim 6 in which providing a support structure includes molding a cladding material to form the support structure.

8. The method of claim 5 in which the support structure includes a sticky surface and in

which the support structure is adhered to the first component, the second component, and the waveguide by contacting to the sticky surface.

9. The method of claim 1 further comprising applying a second formable material into the mold to clad the waveguide material.

10. The method of claim 9 in which applying the second formable material includes applying the material to fix the first and second component together in alignment.

11. The method of claim 10 further comprising inserting a substrate element into the mold and in which applying the second formable material includes applying the second formable material to fix the first and second components onto the substrate.

12. The method of claim 9 in which applying the second formable material includes applying the material to form an enclosure or other protecting, supporting or subsequent aligning structure.

13. The method of claim 9 in which a third formable material is applied to form an enclosure or other protecting, supporting or subsequent aligning structure.

Claims 14-18 (cancelled)

19. A method of forming a light-carrying optical waveguide assembly, comprising:

providing a tool having a pattern to be transferred to a light-carrying optical waveguide, the tool aligning an optical component relative to the waveguide pattern;

forming the optical waveguide aligned with the optical component by shaping a formable material using the tool;

hardening the formable material to produce a waveguide aligned with the component; and

after the formable material is hardened, applying a formable cladding material over the optical waveguide.

20. A method of forming an optical waveguide assembly,

providing a tool having a pattern to be transferred to a light-carrying optical waveguide, the tool aligning an optical component relative to the waveguide pattern;

forming the optical waveguide aligned with the optical component by shaping a formable material using the tool; and hardening the formable material to produce a waveguide aligned with the component; and

removing the optical waveguide from the tool by adhering the optical waveguide to a support structure.

21. The method of claim 20 in which adhering the optical waveguide to a support structure includes molding a support structure onto the optical waveguide.

22. The method of claim 20 in which adhering the optical waveguide to a support structure includes contacting a prefabricated molded support structure onto the optical waveguide.

23. The method of claim 20 in which either the support structure or the waveguide is incompletely cured when the optical waveguide is adhered to the support structure.

Claims 24-37 (cancelled)

38. A method of terminating an optical fiber, comprising:

inserting the optical fiber into a mold; and

inserting into the mold a formable light-carrying material, the light-carrying material contacting the optical fiber and forming a light path to or from the optical fiber, the light path including two ends, a proximal end carrying light to or from the optical fiber and a distal end formed into a connecting structure having an optical axis and a connecting surface through which light is carried to a connecting component, the connecting surface being oriented at an angle of

between 0 degrees and 55 degrees from a normal to the optical axis.

Claims 39-44 (cancelled)

45. A method of forming a light-carrying waveguide, comprising:

providing a precision mold having there in a cavity corresponding to the desired shape of the waveguide;

inserting a formable material into the cavity of the precision mold, the formable material taking on at least in part the shape of the cavity to form the waveguide;

hardening the waveguide; and

removing the waveguide from the precision mold.

46. The method of claim 45 in which removing the waveguide from the precision mold includes providing a support structure to adhere to the waveguide as it is removed.

47. The method of claim 46 in which providing a support structure to adhere to the waveguide includes molding a support structure onto the waveguide.

48. The method of claim 47 in which molding a support structure onto the waveguide includes molding a cladding material onto the waveguide.

49. The method of claim 46 in which the support structure includes a sticky surface and in which the support structure is adhered to the waveguide by contacting to the sticky surface.

50. The method of claim 45 further comprising applying a second formable material into the mold to clad the waveguide material.

51. A waveguide formed in accordance with the method of claim 45.

52. The method of claim 1 in which positioning the laser or other active optical component includes using bumps associated with electrical contacts on the component.

53. The method of claim 1 in which positioning the laser or other active optical

component includes using bumps, pins, precision laser-drilled or micro-machined holes associated with electrical contacts on the component.

54. The method of claim 1 in which positioning the laser or other active optical component includes using precision location features provide by the component manufacturer.

55. The method of claim 1 in which positioning a first component in the mold includes positioning a single mode optical fiber in the mold.

56. A method of forming an assembly of optical components, comprising:

positioning a first component in a mold;

positioning a second component in the mold; and

applying a formable material into the mold to form a light-carrying waveguide between the first and second components, the waveguide forming an optical path between the first component and the second component,

removing the first component, the second component, and the waveguide from a mold used to form the waveguide by providing a support structure to support the first component, the second component, and the waveguide as it is removed.

57. The method of claim 56 in which the support structure is adhered to the first component, the second component, and the waveguide.

58. The method of claim 57 in which the support structure is molded onto the first component, the second component, and the waveguide.

59. The method of claim 58 in which providing a support structure includes molding a cladding material to form the support structure.

60. The method of claim 56 in which the support structure includes a sticky surface and in which the support structure is adhered to the first component, the second component, and the

waveguide by contacting to the sticky surface.

61. The method of claim 56 in which:

positioning a first component in a mold or positioning a second component in the mold includes aligning an active optical element using an alignment structure; and

applying a formable material into the mold to form a light-carrying waveguide between the first and second components includes applying a formable material into the mold to form a light-carrying guide to the active optical component, the light carrying waveguide guide being sufficiently aligned with the active optical element to eliminate the need for active alignment.

62. The method of claim 56 in which applying a formable material into the mold includes injecting the formable material under pressure into a mold cavity.

63. The method of claim 56 in which applying a formable material into the mold includes screening or stenciling the formable material into depressions on a mold plate.

64. The method of claim 61 in which the light carrying waveguide guide is aligned with the active optical element to within 5 microns.

65. The method of claim 61 in which the light carrying waveguide guide is aligned with the active optical element to within 3 microns.

66. A method of making an optical assembly, comprising:

providing a precision mold having an alignment structure within the mold for aligning at least one active optical element and having a structure for forming a light-carrying waveguide to the at least one optical element;

positioning the at least one active optical component within the precision mold using the alignment structure;

filling the structure for molding a light-carrying waveguide to the at least one optical

element with a waveguide forming material; and

removing the precision at least one optical element and the light-carrying waveguide from the precision mold, the alignment structure providing sufficiently accurate alignment to eliminate the requirement for active alignment.

67. The method of claim 66 in which filing the structure for molding a light-carrying waveguide includes injecting a wave guide forming material under pressure.

68. The method of claim 66 in which filing the structure for molding a light-carrying waveguide includes screening or stenciling a wave guide forming material onto a mold plate.

69. The method of claim 66 in which removing the at least one optical element and the light-carrying waveguide from the precision mold includes removing the at least one optical element and the light-carrying waveguide adhered to a support structure.

70. The method of claim 69 in which the support structure is molded over the at least one optical element and the light-carrying waveguide.

X. Evidence Appendix

None

XI. Related Proceedings Appendix

None